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TECH MEMO

a working paper

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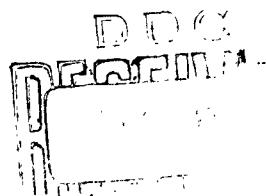
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Proposal for Variable Field Definition Pseudo Operation
in LARII

A variable Field Definition (VFD) pseudo will generate one or more words of data made up of one or more subfields.

The constituents of a VFD pseudo operation would be a VFD in the operation field and one or more subfields in the M-term. If a symbol appears in the location field the tag would be assigned to the location of the first word generated.

Seven types of subfields would exist:

- 1) M-term
- 2) Octal
- 3) Decimal
- 4) Hollerith
- 5) Flexowriter
- 6) Teletypewriter
- 7) Literal



The format of a subfield is:

1. The number of bits of data this subfield is to generate. This is specified by an unsigned decimal integer between one and ninety-six.
2. A single letter to specify the type of information given by the subfield. This letter follows the decimal integer.

The letter "M" specifies an M-term format subfield.
The letter "B" specifies an Octal format subfield.
The letter "D" specifies a Decimal format subfield.
The letter "H" specifies a BCD format subfield.
The letter "F" specifies a FLX format subfield.
The letter "T" specifies a TEL format subfield.
The letter "L" specifies a Literal format subfield.

The letter is followed by a slash "/", and the actual data subfield is contained between this slash and the first blank or comma (whichever is encountered first). In the case of a comma, another subfield begins immediately following the comma. A blank terminates the VFD pseudo op M-term.

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The type of information given following the slash depends on the letter:

1. In the case of an M, the data item consists of any legal symbolic M-term expression (except a literal).
2. In the case of a B, the data item consists of a legal M-term for the OCT pseudo operation.
3. In the case of a D, the data item consists of a legal M-term for the DEC pseudo operation.
4. In the case of an H, F, or T, the data item consists of a legal M-term for the BCD, FLX, or TEL pseudo operations respectively, except that no character can be a comma or a blank. A word count cannot be specified.
5. In the case of an L, the data item consists of a legal literal subfield. If the literal is of the M-term type, it must contain a comma to specify upper and lower addresses of the literal word (even if one is zero) unless it is the last subfield in the VFD.

Any number of subfields may be used.

The subfields are taken in order and are left justified. A subfield may take up more than one word. If the bit count for the first subfield is 50, the first 48 bits would go in word one, and the last two bits in Bit 47 and Bit 46 of word two. This procedure applies independent of the starting place of the subfield. One subfield may require up to three words to contain it. Each subfield is exactly the length of its bit count, regardless of the number of bits required to generate the data item. If the total number of bits in all subfields is not a multiple of forty-eight, the low order bits of the last word are filled out with zeros.

M-term data items

The data item in a M-term subfield is evaluated as if it were a standard M-term, but without cognizance of literals (a "C" error will be flagged if the character "=" exists in this data item, see TM-849/000/00). Let the specified bit count be n. If the data item just generated is less than n bits in length, it will be right adjusted in an n bit field, with enough leading zeros to make an n bit byte. The n bits are packed in the manner described above. If the data item is greater than n bits in length, only the rightmost n bits are used. Neither of these conditions is regarded as an error. If the data item generated is a relocatable expression, then the subfield must be so situated with respect to other subfields that its rightmost bit falls in Bit 0 or Bit 2⁴ of a word. Further, the bit count must be fifteen or more. If this environment is not supplied, a relocation error will be flagged.

Octal data items

An Octal subfield data item may consist of any valid M-term for the OCT pseudo operation. Let n be the bit count for the subfield. If the data item as generated occupies less than n bits, sufficient zeros are placed to the left of the value to form an n bit subfield. If the data item occupies more than n bits, only the rightmost n bits are used. These conditions will not be flagged as errors.

Decimal data items

A Decimal subfield data item may consist of any valid M-term for the DEC pseudo operation. After the value is generated, it is treated exactly the same as an octal subfield.

Hollerith data item

The data item in a Hollerith subfield consists of a string (up to sixteen) of legal BCD characters, none of which is a comma or a blank. Let n be the bit count for the subfield. If the data item generated is longer than n bits, only the rightmost n bits are used. If it is less than n bits, sufficient blanks are placed to the left of the value to form an n bit subfield. If the bit count is not a multiple of six, then the leftmost blank has its left bits truncated. The bit count will not be flagged as an error in either case.

Flexowriter data items

The data item of a FLX subfield is converted as the M-term of a FLX pseudo op. There can be up to 16 characters not counting the minus zeros. Minus zero retains its meaning (shift mode), but none of the characters can be a comma or a blank. Let n be the bit count. If the data item generated occupies more than n bits, only the rightmost n bits are used. If it occupies fewer than n bits, sufficient blanks (flexowriter code for blanks) are placed to the left of the value to create an n bit subfield. Truncation of the leftmost blank follows the same rules as in the case of Hollerith data items. None of these conditions will be flagged as an error.

Teletypewriter data items

The data item of a TEL subfield is converted as the M-term of a TEL pseudo operation. The same rules apply as in the case of the Flexowriter data item.

Literal data items

The data item in a Literal subfield consists of a type letter followed by the literal data item. There are two special cases with literals. An octal

literal has its type letter (B) at the end and a decimal literal has none at all. The same values apply here also. (See TM-849/000/00 for literals and their types.) The appearance of this type of subfield directs the assembler to generate a data item according to the rules governing literal subfields, and to then let the subfield in the VFD instruction be the location of the literal just generated. This subfield will be relocatable if the program is relocatable. The bit count for a literal subfield must be fifteen or more. Further, the rightmost bit of the subfield must fall in Bit 0 or Bit 24 of a word. A violation of either of these rules will be flagged as a relocation error, even if the program is absolute. If the bit count is greater than fifteen, the leftmost bits are filled with zeros. This is not flagged as an error.

The element asterisk may be used in an M-term subfield or an M-term literal, within a literal subfield. The value assigned to the asterisk in both cases is the location of the word which contains the leftmost bit of the VFD subfield when it is assigned. The remainder of this subfield may be in the next word (or the next two words), but the first word is always chosen.

Examples:

START	VFD	6H/A,3B/5,15M/A+10B
A	VFD	60H/ AESTEFH
	VFD	24L/15B,24D/10
	VFD	24L/HABCD ,24L/512

These would generate the following words, assuming START is at cell 10000.

10000	61	5	10011	00	0	00000
10001	20	6	16263	64	6	56667
10002	70	7	10000	00	0	00000
10003	00	0	20000	00	0	00012
10004	00	0	20001	00	0	20002
	.					
	.					
20000	00	0	00000	00	0	00015
20001	61	6	26364	20	2	02020
20002	00	0	00000	00	0	01000

Literals at end of program.

19 December 1962

TM-809/002/00

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Reports that a Variable Field
Definition (VFD) pseudo will
generate one or more data words
made up of one or more subfields.
Also reports that the constituents
of a VFD pseudo operation will be
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